

DRAFT

REQUEST FOR ADDITIONAL INFORMATION

OFFICE OF NUCLEAR REACTOR REGULATION

AGING MANAGEMENT PROGRAM FOR REACTOR VESSEL INTERNALS

FIRSTENERGY NUCLEAR OPERATING COMPANY

BEAVER VALLEY POWER STATION, UNITS 1 AND 2

DOCKET NOS. 50-334 AND 50-412

By letter dated January 27, 2014 (Reference 1), FirstEnergy Nuclear Operating Company (the licensee) submitted two reports for its License Renewal Reactor Vessel Internals (RVI) Aging Management Program (AMP) Plan at Beaver Valley Power Station (BVPS), Units 1 and 2, which credits the implementation of Materials Reliability Program (MRP)-227-A, "Pressurized Water Reactor (PWR) Internals Inspection and Evaluation Guidelines" (Reference 2). To complete its review of the BVPS AMP Plan, the NRC staff requires additional information as detailed below.

**RAI-1:**

In Section 6.2.1 of the AMP Plans, the licensee has addressed Action Item 1 from the NRC staff's safety evaluation (SE) of MRP-227, dated June 22, 2014 (Reference 3), saying that the assumptions regarding plant design and operating history made in MRP-191, "Materials Reliability Program: Screening, Categorization, and Ranking of Reactor Internals Components for Westinghouse and Combustion Engineering PWR Design," (Reference 4) are appropriate for BVPS, Units 1 and 2.

The NRC staff requests that additional information, as discussed in References 5 and 6, and outlined below, be provided to verify the applicability of MRP-227-A for each unit.

- RAI-1(a) Do the RVIs for each unit have any non-weld or bolting austenitic stainless steel components with 20 percent (%) cold work or greater, and if so do the affected components have operating stresses greater than 30 ksi? If so, perform a plant-specific evaluation to determine the aging management requirements for the affected components.
- RAI-1(b) Has either BVPS Unit 1 or 2, ever utilized atypical fuel design or fuel management that could make the assumptions of MRP-227-A regarding core loading/core design non-representative for that plant, including power changes/uprates? If so, describe how the differences were reconciled with the assumptions of MRP-227-A or provide a plant-specific aging management program for affected components as appropriate.

The licensee may use the Electric Power Research Institute (EPRI), MRP-227-A Applicability Template Guidelines (Reference 7) to answer these RAIs.

## RAI-2

As discussed in Section 3.3.7 of Revision 1 to the SE for MRP-227 (Reference 8), Action Item 7 requires that the licensees of Westinghouse reactors develop plant-specific analyses to be applied for their facilities to demonstrate that lower support column cast austenitic stainless steel (CASS) bodies will maintain their function during the extended period of operation. Table 6-2 of the AMP Plans includes the summary of CASS components and their susceptibility to thermal embrittlement (TE) according to the MRP-175, "Materials Reliability Program: PWR Internals Material Aging Degradation Mechanism Screening and Threshold," (Reference 9) screening criteria for TE (less than 20% is not susceptible while  $\geq 20\%$  is susceptible). The licensee's evaluation used a screening approach using the criteria of NRC Letter, "License Renewal Issue No. 98-0030, Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Components," (Reference 10). The result of the screening was that some CASS components were determined to be nonsusceptible (screened out) for TE.

The staff expects components that screened out for TE should still be screened for irradiation embrittlement (IE) based on the peak neutron fluence for the component, as listed in Table 4-6 of MRP-191, for Westinghouse-designed units. In addition, the licensee should consider the combined effect of TE and IE to have an acceptable plant-specific analysis.

RAI-2(a) Provide plant-specific analysis on the combined effect of TE and IE, or a justification on why this analysis is not required.

The staff's initial evaluation indicates that the lower support column bodies for Unit 1 are susceptible to IE even though it passes the screening to TE in MRP-191.

RAI-2(b) Provide additional information on the ferrite content of the lower support boddies for BVPS Unit 1, to help the NRC staff reach a decision based on the combined effect of TE and IE.

For the staff's initial evaluation of Unit 2, the lower support column bodies are not manufactured from CASS, but should still be considered susceptible to IE.

RAI-2(c) Given that the lower support column bodies for both units are susceptible to IE, clarify why the primary inspection component links to a possible expansion inspection of the lower support bodies for BVPS Units 1 and 2 are adequate.

### References

1. Submittal of WCAP-17789-NP, "PWR Vessel Internals Program Plan for Aging Management of Reactor Internals at Beaver Valley Power Station Unit 1," Revision 1 and WCAP-17790-NP, "PWR Vessel Internals Program Plan for Aging Management of Reactor Internals at Beaver Valley Power Station Unit 2," Revision 1, January 27, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14030A131)
2. "PWR Reactor Internals Inspection and Evaluation Guidelines (MRP-227-A)," January 9, 2012, (ADAMS Accession No. ML120170453)

3. Final Safety Evaluation of EPRI Report, Materials Reliability Program Report (MRP-227), Revision 0, "Pressurized Water Reactor (PWR) Internals Inspection and Evaluation Guideline" TAC No. ME0680, June 22, 2011 (ADAMS Accession No. ML111600498)
4. "Materials Reliability Program: Screening, Categorization, and Ranking of Reactor Internals Components for Westinghouse and Combustion Engineering PWR Design (MRP-191)," November 2006 (ADAMS Accession No. ML091910130)
5. Summary of January 22-23, 2013, Closed Meeting with the Electric Power Research Institute and Westinghouse, February 21, 2013, (ADAMS Accession No. ML13042A048)
6. Summary of February 25, 2013, Telecom with the Electric Power Research Institute and Westinghouse Electric Company, March 15, 2013 (ADAMS Accession No. ML13067A262)
7. EPRI letter to MRP, "MRP-227-A Applicability Template Guidelines," MRP 2013-025, October 14, 2013 (ADAMS Accession No. ML13322A454)
8. Revision 1 to the Final Safety Evaluation of EPRI Report, Materials Reliability Program Report (MRP-227), Revision 0, "Pressurized Water Reactor (PWR) Internals Inspection and Evaluation Guideline" TAC No. ME0680, December 16, 2011, (ADAMS Accession No. ML11308A770)
9. "Materials Reliability Program: PWR Internals Material Aging Degradation Mechanism Screening and Threshold Values, (MRP-175), December 2005, (ADAMS Accession No. ML063470637)
10. "License Renewal Issue No. 98-0030, Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Components," May 19, 2000 (NRC ADAMS Accession No. ML003717179)